

Ocean Heat Reveals More About Climate



Courtesy of NOAA

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A chief question for many climate scientists continues to be: How much has Earth really warmed in recent decades? In a new study, an international group of scientists seeks answers from the world's oceans. Their analysis in a [new article](#) published by the open-access journal *Science Advances* furthers the discussion.

Researchers want to know more about the ocean because it absorbs most of the planet's heat. The ocean acts as a sponge for excess heat in Earth's system, more than 90 percent of the excess. So, determining reliable estimates of ocean heat contributes significantly to global warming research.

Researchers from the Institute of Atmospheric Physics at the Chinese Academy of Sciences in Beijing, China, the National Center for Atmospheric Research in Boulder, NOAA's NCEI, and the University of St. Thomas in Minnesota, took a look at the ocean's heat history to approach the question of global warming.

Their work builds on recent investigations of water temperature data from the surface to 2,000 meters deep in the oceans, crucial in understanding Earth's temperatures. The magnitude and location of ocean heat content have become an area of active scientific research.

Honing in on Ocean Temperature

Global [ocean heat content](#) (OHC) assessments come from subsurface temperature profiles taken over time from many locations around the ocean. But, because of its vastness, remoteness, and susceptibility to bad weather, the ocean has historically challenged even the most ardent scientific efforts at data collection. Since 1960, changes have occurred in collecting ocean temperatures that improve coverage and accuracy over time. But, variability in data coverage leaves scientists with the task of creating models and methodologies that accurately reflect what has and is happening to the ocean, and hence, any related repercussions to the planet.

For the recent study, the scientists scrutinized the connection between the ocean and Earth's energy imbalance (EEI), which drives global warming. The ocean absorbs all but a small percentage of the EEI, so a measure of change in OHC equals a measure of the majority of excess heat in Earth's system.

The researchers created new methodologies to follow heat content that extend and improve on existing mapping strategy. They built a gridded temperature field from the ocean surface to 2,000 meters below. They use temperature data from the beginning of 1960 through the end of 2015 and construct an ocean "energy budget" for that time period. The group looked farther back in the record but determined that it wasn't adequate enough prior to approximately 1960. The scientists relied on newer observations from a fleet of [Argo floats](#) to verify past conditions, taking into account variability and sampling error.

Study Reveals the Ocean Warms Up

From the mapping methodology, developed by lead author Lijing Cheng and coauthor, Liang Zhu of the Institute of Atmospheric Physics, the scientists found

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